REMARKS

The Examiner has rejected Claims 1-2, 4-5, 7-15, 17-18, and 20-31 under 35 U.S.C. 103(a) as being unpatentable over Rumpf et al. ("Using Graphics Cards for Quantized FEM Computations"), in view of Wang ("A Processor Architecture for 3D Graphics", September 19992, IEEE Computer Graphics & Applications). Further, the Examiner has rejected Claims 1-2, 12-15, 17-18, 20-23, and 27 under 35 U.S.C. 103(a) as being unpatentable over Press ("Numerical Recipes in Fortran 77), in view of Rumpf ("Using Graphics Cards for Quantized FEM Computations"), and in further view of Burden ("Numerical Analysis"). In addition, the Examiner has rejected Claims 10-11 under 35 U.S.C. 103(a) as being unpatentable over Press, in view of Rumpf, and in further view of Burden. Additionally, the Examiner has rejected Claims 26, 28, and 30-31 under 35 U.S.C. 103(a) as being unpatentable over Press, in view of Rumpf, and in further view of Burden. Furthermore, the Examiner has rejected Claim 29 under 35 U.S.C. 103(a) as being unpatentable over Press, in view of Burden, and in further view of Rumpf. Applicant respectfully disagrees with such rejections, especially in view of the amendments made hereinabove to some of the independent claims.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *In re Vaeck,*947 F.2d 488, 20 USPQ2d 1438 (Fed.Cir.1991).

With respect to the first element of the *prima facie* case of obviousness, the Examiner has stated that "the motivation to use the art of Rumpf with the art of Press would have been the benefits recited in Rumpf that the presented strategy opens a wide

area of numerical applications for hardware acceleration (***first page, Abstract, first paragraph***), and turns a graphics card into an ultrafast vector coprocessor (***first page, Abstract, first paragraph***), which would have been recognized by the ordinary artisan as benefits that allow faster processing." Applicant respectfully disagrees with this proposition, especially in view of the vast evidence to the contrary.

For example, Press relates to implementing mathematics in software, while Rumpf relates to using graphics cards for quantized FEM computations. To simply glean features from a system for performing quantized FEM computations using graphics cards, such as that of Rumpf, and combine the same with the *non-analogous art* of software-implemented mathematics, such as that of Press, would simply be improper. Graphics cards provide broad access to graphics memory and parallel processing of image operands (see the Abstract of Rumpf), while software-implemented mathematics merely relate to using software to carry out mathematical operations. "In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." In re Oetiker, 977 F.2d 1443, 1446, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992). See also In re Deminski, 796 F.2d 436, 230 USPQ 313 (Fed. Cir. 1986); In re Clay, 966 F.2d 656, 659, 23 USPQ2d 1058, 1060-61 (Fed. Cir. 1992). In view of the vastly different types of problems software-implemented mathematics addresses as opposed to graphics cards, the Examiner's proposed combination is clearly inappropriate.

In the Office Action mailed 12/06/2007, on Pages 3-4, the Examiner has argued that "the motivation to use the art of Rumpf with the art of Press would have been the benefits recited in Rumpf that the presented strategy opens a wide area of numerical applications for hardware acceleration (***first page, Abstract, first paragraph***), and turns a graphics card into an ultrafast vector coprocessor (***first page, Abstract, first paragraph***), which would have been recognized by the ordinary artisan as benefits that allow faster processing that allow faster processing." Further, the Examiner has argued that "[s]ince

this motivation is taken from the reference, and has obvious benefits of saving computation time, the motivation appears acceptable."

Again, applicant respectfully asserts that in view of the vastly different types of problems software-implemented mathematics addresses as opposed to graphics cards, the Examiner's proposed combination is clearly inappropriate. For example, Rumpf clearly indicates that "many numerical algorithms still disregard hardware issues and little humps in the graphics hardware **still obstruct the passage to general fast numerical computations**" (Page 194, Goals – emphasis added). Clearly, Rumpf's teaching that many numerical algorithms still disregard hardware issues and therefore obstruct the passage to general fast numerical computations, simply fails to support the Examiner's assertion that "the ordinary artisan [would have been recognized]… benefits that allow faster processing that allow faster processing."

Further, in the Office Action mailed 12/06/2007, on Page 4, the Examiner has argued that "the art of Rumpf and the art of Press are analogous art at least because they both pertain to solving partial differential equations, which is 'reasonably pertinent to the particular problem with which the inventor was concerned'" and that "the ordinary artisan would have known that software is at least implemented on hardware for use, and so is reasonably pertinent."

Applicant respectfully disagrees and asserts that Rumpf teaches that "we had to approximate all involved nonlinear functions by linear in the implementation of the anisotropic diffusion" which "leads to an deterioration in image quality in the following timesteps" and that "the restricted precision of 8 bits per color component leads to unsatisfying results for the linear heat equation, because smooth transitions in temperature produce very small values in the convolution, with very high relative errors" (Page 201, Section 8: Performance Measurements and Conclusions – emphasis added). Clearly, the problems such as a deterioration in image quality and unsatisfying results for the linear heat equation with very high relative errors faced by Rumpf's use of graphics cards, are vastly different types of problems than those addressed by software-

implemented mathematics of Press, and as such, the Examiner's proposed combination is clearly inappropriate.

In addition, applicant respectfully asserts that the software mathematics of the Press and Press2 references are implemented using "Fortran 77" and "C" (see respective Titles), but are not disclosed to be directly on a graphics card. For example, Page 860 of Press discloses implementing "a routine for SOR with Chebyshev acceleration" in Fortran. Further, Rumpf discloses having to "approximate all involved nonlinear functions by linear in the implementation of the anisotropic diffusion" which "leads to an deterioration in image quality in the following timesteps," and that "the restricted precision of bits per color component leads to unsatisfying results for the linear heat equation… with very high relative errors" (Section 8, second column, paragraph 3 – emphasis added). Again, applicant respectfully asserts that the Examiner's proposed combination is clearly inappropriate in view of the vastly different types of problems addressed by software-implemented mathematics as opposed to those addressed by graphics card-implemented quantized FEM computations.

In the Office Action mailed 12/06/2007, on Page 5, the Examiner has argued that applicant's aforementioned statements "[appear] to be a premise, and does not appear to result in the conclusion that, 'the Examiner's proposed combination is clearly inappropriate in view of the vastly different types of problems addressed by software-implemented mathematics as opposed to those addressed by graphics card-implemented quantized FEM computations'."

Applicant respectfully disagrees and asserts that Rumpf's use of graphics cards for Quantized FEM Computations faces problems such as a deterioration in image quality and unsatisfying results for the linear heat equation with very high relative errors, as argued above. Further, Rumpf teaches that "graphics hardware development closely followed the needs of the graphics programmers, whereas the general purpose microprocessor could not be oriented solely towards graphics requirements" (Page 193, Section 1: Introduction – emphasis added). However, graphics cards face very different

types of problems than those addressed by software-implemented mathematics, and as such, the Examiner's proposed combination is clearly inappropriate. "In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned" (emphasis added). In re Oetiker, 977 F.2d 1443, 1446, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992). See also In re Deminski, 796 F.2d 436, 230 USPQ 313 (Fed. Cir. 1986); In re Clay, 966 F.2d 656, 659, 23 USPQ2d 1058, 1060-61 (Fed. Cir. 1992). Clearly, the problems faced when using graphics hardware developed for the needs of graphics programmers for implementing quantized FEM computations are vastly different from the problems addressed for software-implemented mathematics implemented for a general purpose microprocessor. Again, applicant respectfully asserts that the Examiner's proposed combination is clearly inappropriate in view of the vastly different types of problems addressed by software-implemented mathematics as opposed to those addressed by graphics card-implemented quantized FEM computations.

Further, in the Office Action mailed 12/06/2007, on Page 5, the Examiner has argued that "[f]urther, the problems addressed by the software of Press appear to be similar to the problem addressed by graphics card implemented quantized FEM computations at least because they both pertain to solving partial differential equations, and further Rumpf teaches using a Jacobi solver relaxation method (Section 8), and Press also teaches using the Jacobi method in section 19.5 Relaxation Methods for Boundary Value Problems."

Applicant respectfully disagrees and asserts that Rumpf teaches that "[i]n the case of the linear heat equation one iteration of the Jacobi solver takes approximately 1.6ms," however "the restricted precision of 8 bits per color component leads to unsatisfying results for the linear heat equation, because smooth transitions in temperature produce very small values in the convolution, with very high relative errors" (Page 201, Section 8: Performance Measurements and Conclusions). Clearly, as argued above, the unsatisfying results for the linear heat equation with very high relative errors indicates that the

problems addressed by implementing quantized FEM computations using graphics hardware, as in Rumpf, are vastly different from the problems addressed for software-implemented mathematics implemented for a general purpose microprocessor. Therefore, applicant asserts that the Examiner's combination is clearly inappropriate in view of the vastly different types of problems addressed by software-implemented mathematics as opposed to those addressed by graphics card-implemented quantized FEM computations.

In addition, in the Office Action mailed 12/06/2007, on Page 5, the Examiner has argued that "a new reference, 'Diffusion models and their accelerated solution in image and surface processing' appears to teach that graphics cards execute commands from memory (page 26, section 5, first paragraph) used to solve partial differential equation on a graphics processor."

First, applicant respectfully disagrees that the new Rumpf reference, hereinafter Rumpf2, simply suggests "to perform an addition, the corresponding command is sent to the GPU, which then gets the operands back from the texture memory, processes them and writes the result back to the texture memory" (Page 26, Section 5 – emphasis added). Clearly, performing an addition by sending the command to the GPU, as in Rumpf2, simply fails to support the Examiner's allegation that "a new reference... appears to teach that graphics cards execute commands from memory... used to solve partial differential equation on a graphics processor" (emphasis added), as alleged by the Examiner.

Second, applicant respectfully asserts that the Examiner's reliance on the Rumpf2 reference constitutes a reference separate from those in the relevant rejections under 35 U.S.C. 103(a). The Examiner is reminded that the Federal Circuit requires that there must be some logical reason apparent from the evidence of record that would justify the combination or modification of references. In re Regel, 188 USPQ 132 (CCPA 1975). Thus, the reliance on the Rumpf2 reference, on its face, is clearly improper.

Furthermore, Rumpf discloses that "many numerical algorithms <u>still disregard hardware issues</u> and <u>little humps in the graphics hardware</u> <u>**still obstruct the passage to general fast numerical computations**</u>" (Section 1, Goals, paragraph 4 – emphasis added). Applicant asserts that Rumpf's disclosure that many algorithms disregard hardware issues and that graphics hardware <u>obstructs passage</u> to general fast numerical computations clearly *teaches away* from the software-implemented <u>general mathematics</u> of the Press references. *In re Hedges, 783 F.2d 1038, 228 USPQ 685 (Fed. Cir. 1986).*

In the Office Action mailed 12/06/2007, on Page 6, the Examiner has argued that "Rumpf also teaches in the same section, 'Certainly there are some obstacles...but the overall hardware design and development amazingly fits the numerical purpose,' which clearly indicates an expectation of successful implementation." Further, the Examiner has argued that "since Rumpf actually implemented the linear equation solver on the graphics card, any concerns over success were certainly overcome."

Applicant respectfully disagrees and again asserts that Rumpf further teaches that "many numerical algorithms <u>still disregard hardware issues</u> and <u>little humps in the graphics hardware</u> <u>**still obstruct the passage to general fast numerical computations**</u>" (Section 1, Goals, paragraph 4 – emphasis added) such as "the <u>restricted precision</u> of 8 bits per color component leads to <u>unsatisfying results</u> for the linear heat equation, because smooth transitions in temperature produce very small values in the convolution, with <u>very high relative errors</u>" (Page 201, Section 8: Performance Measurements and Conclusions – emphasis added). Clearly, the restricted precision that leads to <u>unsatisfying results</u> for the linear heat equation is one concrete example of a hump in the graphics hardware that <u>obstructs the passage to general fast numerical computations</u>. Therefore, the teachings that many <u>numerical algorithms still disregard hardware issues</u> and humps in the graphics hardware <u>obstruct the passage to general fast numerical computations</u>, as in Rumpf, clearly *teach away* from the software-implemented <u>general mathematics</u> of the Press references. It is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983)

In the Office Action mailed 12/06/2007, on Page 7, the Examiner has argued that "[w]hile Rumpf teaches a graphics hardware solver for the linear heat equation, the hardware is being used to implement an algorithm (section 6, pseudo code) using instructions (section 2 Computational Setting, first paragraph, 'our applications are based on the OpenGL API [12], and to provide accuracy we will refer to the OpenGL commands in the text')." Further, the Examiner has argued that "[r]egarding teaching away, since Rumpf actually implemented the linear equation solver on the graphics card, any concerns over success were certainly overcome."

Applicant respectfully disagrees and asserts that Rumpf merely teaches using "the Jacobi solver with the fixed number of 10 iterations... for solving of the linear system of equations" and that "the restricted precision of 8 bits per color component leads to unsatisfying results for the linear heat equation" (Page 201, Section 8: Performance Measurements and Conclusions). Clearly, Rumpf's disclosure of unsatisfying results for the linear heat equation fails to support the Examiner's argument that "any concerns over success were certainly overcome" (emphasis added). Therefore the unsatisfying results for the linear heat equation of Rumpf simply *teach away* from the software-implemented general mathematics of the Press references.

Also in the Office Action mailed 07/12/2007, the Examiner has argued that "hardware and software are equivalent (please refer to the new reference by Tanenbaum, Structured Computer Organization, 1984, page 11)." Applicant respectfully disagrees and asserts that the Examiner's reliance upon the Tanenbaum reference constitutes a reference(s) separate from those in the relevant rejection under 35 U.S.C. 103(a). Further, it is noted that the Examiner has failed to cite specific motivation in the relevant reference(s) to support the case for combining the Press, Rumpf, and Tanenbaum reference(s). The Examiner is reminded that the Federal Circuit requires that there must be some logical reason apparent from the evidence of record that would justify the combination or modification of references. *In re Regel*, 188 USPQ 132 (CCPA 1975). Thus, the reliance on the Tanenbaum reference(s), on its face, is clearly improper.

In the Office Action mailed 12/06/2007, on Page 7, the Examiner has argued that "it appears that the reference to Tanenbaum is not strictly needed to overcome [a]pplicant's argument, and so the reference is withdrawn except as teaching knowledge of the ordinary artisan at the time of invention that hardware and software are equivalent."

Applicant strongly disagrees with the Examiner's allegations that "hardware and software are equivalent." Applicant asserts that if "hardware and software are equivalent," as alleged by the Examiner, then Rumpf would not disclose the "<u>unsatisfying results</u> for the linear heat equation" (Page 201, Section 8: Performance Measurements and Conclusions – emphasis added). Clearly, the <u>unsatisfying results</u> for the linear heat equation, as in Rumpf, suggest that graphics hardware implemented mathematics and software implemented mathematics are <u>not</u> equivalent.

To this end, at least the first element of the *prima facie* case of obviousness has not been met, since it would be *unobvious* to combine the references, as noted above.

More importantly, applicant also respectfully asserts that the third element of the *prima facie* case of obviousness has not been met by the prior art excerpts relied on by the Examiner. For example, with respect to the independent claims, the Examiner, in the rejection for Claim 29, has relied upon Pages 384-393 and 403 from Burden to make a prior art showing of applicant's claimed "determining whether the solution has converged by: calculating errors, summing the errors, and concluding that the solution has converged if the sum of errors is less than a predetermined amount" (see this or similar, but not necessarily identical language in the aforementioned independent claims – as amended). Specifically, the Examiner has argued that "page 403, Jacobi Iterative Algorithm 7.1, step 4, if | | x–XO < TOL | | then OUTPUT(x1,...xn); STOP..." and that "TOL is a predetermined amount and... | | x-XO | | calculates errors x-XO and takes the norm, see pages 384-392, and especially page 393, exercise 2 which defines a norm that sums the vector compounds."

Applicant respectfully disagrees and asserts that Burden discloses a Jacobi Iterative Algorithm, which is "[a]n iterative technique to solve the n x n linear system Ax = b [that] starts with an initial approximation $x^{(0)}$ to the solution x, and generates a sequence of vectors ...that converges to x" (Page 400, 7.3 Iterative Techniques for Solving Linear Systems, first paragraph). Further, Burden teaches that XO = $x^{(0)}$, and that, as illustrated in step 4, "*if* $||x\text{–}XO|| < TOL$ *then OUTPUT(x1,...xn); STOP*" (Page 403, Jacobi Iterative Algorithm 7.1).

However, the mere disclosure of if the <u>norm</u> of the <u>solution</u> (x) <u>minus</u> the <u>initial approximation</u> ($x^{(0)}$) to the solution is less than a tolerance (TOL), then the approximate solutions (x1...xn) are output and the while loop stops, as in Burden, simply fails to even suggest "<u>summing the errors</u>," much less "determining whether the solution has converged by: <u>calculating errors</u>, <u>summing the errors</u>, and concluding that the solution has converged if the <u>sum of errors is less than a predetermined amount</u>" (emphasis added), as claimed by applicant. Clearly, disclosing that if a <u>norm</u> of the <u>solution minus the approximate solution</u> is less than a tolerance, then the loop stops, as in Burden, simply fails to even suggest "<u>calculating errors</u>, <u>summing the errors</u>, and concluding that the solution has converged if the <u>sum of errors is less than a predetermined amount</u>" (emphasis added), as claimed by applicant.

Still yet, in the Office Action mailed 07/12/2007, the Examiner has argued that "the specification appears to be silent on the meaning of 'calculating errors.'" Applicant respectfully disagrees, and asserts that applicant's specification, as originally filed, is not silent on "calculating errors," as alleged by the Examiner. For example, see Page 5, lines 4-9; Page 13, lines 4-8; and Page 17, lines 12-29 et al. Of course, such citations (in combination with the remaining specification) are merely examples of the above claim language and should not be construed as limiting in any manner.

In the Office Action mailed 12/06/2007, on Page 12, the Examiner has argued "[w]hile the specification is not silent on 'calculating errors', the specification appears to

be silent on 'the meaning of calculating errors'." Further, the Examiner has argued that "[i]n the specification, page 17, line 12, errors appear to mean 'residuals', but the meaning of residuals is not defined (residuals of what?), nor does an example appear to be provided."

Applicant respectfully disagrees and asserts that, for example, in Claim 29, applicant clearly claims "determining whether the solution has converged by: calculating errors, summing the errors," as claimed. Specifically, see Page 5, lines 4-9; Page 13, lines 4-8; Page 17, lines 12-29; Fig. 2A; and Fig. 8 et al. in the specification for an example of applicant's claimed "calculating errors," as claimed. Of course, such citations (in combination with the remaining specification) are merely examples of the above claim language and should not be construed as limiting in any manner.

To this end, applicant respectfully asserts that at least the first and third elements of the *prima facie* case of obviousness have not been met, since it would be *unobvious* to combine the references, as noted above, and the prior art excerpts, as relied upon by the Examiner, fail to teach or suggest all of the claim limitations, as noted above. Thus, a notice of allowance or a proper prior art showing of all of applicant's claim limitations, in combination with the remaining claim elements, is respectfully requested.

Applicant further notes that the prior art is also deficient with respect to the dependent claims. For example, with respect to Claim 13, the Examiner has relied upon Pages 854-856 in Press to make a prior art showing of applicant's claimed technique "wherein the relaxation operation is selected based on the partial differential equation."

Applicant respectfully disagrees and asserts that the excerpt from Press relied upon by the Examiner merely discloses that "relaxation methods involve splitting the sparse matrix that arises from finite differencing and the iteration until a solution is found" (Page 854). For example, Press discloses a "method...called Jacobi's method" which "is not practical because it converges too slowly," in addition to "[t]he Gauss-Seidel method" which offers a "factor of two improvement in the number of iterations

over the Jacobi method [which] still leaves the method impractical" (Pages 854-857). Clearly, Press is merely disclosing two different classical relaxation methods, the Jacobi's method and the Gauss-Seidel method, which clearly fails to support the Examiner's allegation that "it would have been obvious that the relaxation operation is selected on the partial differential equation," especially in view of applicant's claimed technique, namely "wherein the <u>relaxation operation</u> is <u>selected</u> **<u>based</u>** on the <u>partial differential equation</u>" (emphasis added), as claimed by applicant.

To this end, in response to the Examiner's argument that applicant's specific claim language would have been obvious, applicant again points out the remarks above that clearly show the manner in which some of such claims further distinguish Press. Applicant thus formally requests a specific showing of the subject matter in ALL of the claims in any future action. Note excerpt from MPEP below.

> "If the applicant traverses such an [Official Notice] assertion the examiner should cite a reference in support of his or her position." See MPEP 2144.03.

In the Office Action mailed 12/06/2007, on Page 14 and Page 23, the Examiner has argued that "it would have been obvious that the relaxation operation is selected based on the partial differential equation, especially since such an example is presented; on page 855, the diffusion equation is recited in equation 19.5.3, and then a relaxation method of equation 19.5.5 is derived from the diffusion equation, and as recited below equation 19.5.5, '[t]hus the algorithm consists of using the average of u as at its four nearest-neighbor points on the grid (plus the contribution from the source)... [where t]his procedure is then iterated until convergence'." Further, the Examiner has argued that "[t]hus, the relaxation method appears to have been selected based on the partial differential equation (the diffusion equation)."

Applicant respectfully disagrees and asserts that Press simply discloses an "elliptic equation" (19.5.1) that is rewritten "as a diffusion equation... (19.5.2)" (Pages 854-855). Further, Press discloses that "[i]f we use FTCS differencing (cf. equation

19.2.4), we get… [equation] (19.5.4)" such that if "we try to take the largest possible timestep…[t]hen equation (19.5.4) becomes… [equation] (19.5.5)" (Page 855). In addition, Press discloses that "the algorithm consists of using the average of μ at its four nearest-neighbor points on the grid…" and that "[t]his procedure is then iterated until convergence," where "[t]his method is… called Jacobi's method" (Page 855).

However, the mere disclosure of converting an elliptic equation into a diffusion equation, and utilizing a FTCS differencing, in addition to the disclosure that the algorithm is iterated until convergence, as in Press, fails to teach applicant's claimed technique "wherein the <u>relaxation operation</u> is <u>selected</u> <u>**based**</u> on the <u>partial differential equation</u>" (emphasis added), as claimed by applicant. Clearly, the disclosure of using FTCS differencing on an elliptic equation rewritten as a diffusion equation, as in Press, simply fails to even suggest that "the relaxation operation is <u>selected</u> <u>**based on the partial differential equation**</u>" (emphasis added), as claimed by applicant.

Further, in the Office Action mailed 12/06/2007, on Page 14, the Examiner has argued that "knowledge of the ordinary artisan to select a numerical method for a partial differential equation is taught in the reference, J.L. Bell and G.S. Patterson Jr., 'Data organization in large numerical computations', The Journal of Supercomputing, Volume 1, Number 1, page 130, last paragraph, and page 132, figure 13."

First, applicant respectfully asserts that Bell teaches in Fig. 13 on Page 132 that if the "electromagnetic field equation" is a linear, multiple dimension, separable, rectangle and simple BC, without variable coefficients, non-coulomnic, partial differential equation, then the MFT 6-5-2 solution method is utilized. However, selecting the MFT 6-5-2 solution method when the electromagnetic field equation <u>is a PDE</u>, as in Bell, simply fails to even suggest that "the relaxation operation is <u>selected</u> <u>**based on the partial differential equation**</u>" (emphasis added), as claimed by applicant.

Second, applicant respectfully asserts that the Examiner's reliance on the Bell reference constitutes a reference separate from those in the relevant rejections under 35

U.S.C. 103(a). The Examiner is reminded that the Federal Circuit requires that there must be some logical reason apparent from the evidence of record that would justify the combination or modification of references. In re Regel, 188 USPQ 132 (CCPA 1975). Thus, the reliance on the Bell reference, on its face, is clearly improper.

With respect to Claim 18, the Examiner has relied on Page 855 from the Press reference to make a prior art showing of applicant's claimed technique "wherein it is determined whether the solution has converged after a predetermined number of multiple iterations of the relaxation operation." Further, the Examiner has stated that Press does not specifically teach that "[i]t is determined whether the solution has converged ***after a predetermined number of multiple*** iterations of the relaxation operation." Additionally, the Examiner has relied upon Official Notice and has stated that "processing time would be saved by testing convergence only after multiple iterations for a process that takes multiple iterations to converge." Specifically, as support for Official Notice, the Examiner has relied upon Galligani et al. ("Implementation of Splitting Methods for Solving Block Tridiagonal Linear Systems on Transputers"), Beckmann et al. ("Data Distribution at Run-Time: Re-Using Execution Plans"), and Y. Saad ("Krylov Subspace Methods for Solving Large Unsymmetric Linear Systems").

Applicant respectfully disagrees and asserts that the Examiner's reliance upon the Galligani, Beckmann, and Saad references constitutes a reference(s) separate from those in the relevant rejection under 35 U.S.C. 103(a). Further, it is noted that the Examiner has failed to cite specific motivation in the relevant reference(s) to support the case for combining the Galligani, Beckmann, and Saad reference(s). The Examiner is reminded that the Federal Circuit requires that there must be some logical reason apparent from the evidence of record that would justify the combination or modification of references. In re Regel, 188 USPQ 132 (CCPA 1975). Thus, the reliance on the Galligani, Beckmann, and Saad reference(s), on its face, is clearly improper.

In view of the Examiner's improper reliance on the Galligani, Beckmann, and Saad reference(s), and in response to the Examiner's reliance on Official Notice,

applicant respectfully asserts that, in view of Press, it would not have been obvious to "[determine] whether the solution has converged after a predetermined number of multiple iterations of the relaxation operation," as claimed. Specifically, the excerpt from Press disclosing "interat[ion] until convergence," as relied on by the Examiner, merely relates to "a classical method with origins dating back to the last century, called *Jacobi's method*" (Page 855), which does not even suggest "a predetermined number of multiple iterations," as claimed. Thus, applicant again formally requests a specific showing of the subject matter in ALL of the claims in any future action (MPEP 2144.03).

In the Office Action mailed 12/06/2007, on Pages 15-16, the Examiner has argued that "using the references of Galligani, Beckmann, and Saad to support the Official Notice is proper" and that "[t]he use of the references appears to comply with the MPEP 2144.03." Further, the Examiner has argued that "the rejection specifically recites that the motivation to use the Official Notice would have been the knowledge of the ordinary artisan that processing time would be saved by testing convergence only after multiple iterations for a process that takes multiple iterations to converge."

Applicant respectfully disagrees and asserts the Examiner's reliance on the Galligani, Beckmann, and Saad references constitutes references separate from those in the relevant rejections under 35 U.S.C. 103(a). The Examiner is reminded that the Federal Circuit requires that there must be some logical reason apparent from the evidence of record that would justify the combination or modification of references. In re Regel, 188 USPQ 132 (CCPA 1975). Clearly, the Examiner's mere suggestion that "processing time would be saved" fails to justify the combination or modification of references. Thus, the reliance on the Galligani, Beckmann, and Saad references, on its face, is clearly improper.

Still yet, with respect to Claim 22, the Examiner has relied on Pages 838-840 in Press to make a prior art showing of applicant's claimed technique "wherein if it is determined that the solution has converged, repeating the processing using an altered parameter value." Specifically, the Examiner has argued that "especially note on page

840 below equation 19.2.12, the reference to stepsize Δt," and that "[t]he specification appears to provide a time value as an example of a parameter on page 5, line 9."

Applicant respectfully disagrees and asserts that the excerpt from Press teaches that in order "[t]o solve [the diffusion equation in one space dimension with a constant diffusion coefficient] one has to <u>solve a set of simultaneous linear equations</u> at each timestep for the u_j^{n+1}" (Pages 838-839). Further, the excerpt from Press teaches that "[t]he amplification factor for [the] equation (19.2.8) is... < 1 for any stepsize Δt" which "is unconditionally stable" (Page 840). However, the mere disclosure of solving <u>a set of simultaneous linear equations</u> at <u>each timestep</u> in order to solve the diffusion equation, as in Press, simply fails to even suggest a technique "wherein <u>if it is determined that **the solution has converged**</u>, repeating the processing <u>using an altered parameter value</u>" (emphasis added), as claimed by applicant. Clearly, solving a set of <u>simultaneous linear equations</u> at each timestep, as in Press, simply fails to even suggest that "<u>if it is determined that **the solution has converged**</u>.... the processing [is repeated] <u>using an altered parameter value</u>," where the solution is "the solution to the partial differential equation" (emphasis added), in the context as claimed by applicant (see Claim 1 for context).

In the Office Action mailed 12/06/2007, on Page 19, the Examiner has argued that "the recited art appears to teach the limitation, as follows." Specifically, the Examiner has argued that "[t]he specification appears to provide a time value as an example of a parameters on page 5, line 9." Further, the Examiner has argued that "[i]n the recited art in Press at pages 838 – 840, time is clearly used to advance the solution after a set of linear equations are solved at a current timestep" where "[t]he solution of the linear equations require convergence of the solution, and then time is advanced, [a]nd thus the altered parameter of time is used in the next timestep where a different set of linear equations are solved."

Applicant respectfully disagrees and again asserts that Press simply discloses that "[t]o <u>solve equation</u> (19.2.8) one has to <u>solve a set of simultaneous linear equations</u> at

each timestep for the u_j^{n+1}" (Page 839). Clearly, Press teaches that to solve the equation, then one has to solve a set of simultaneous linear equations at each timestep, which fails to suggest that a technique "wherein if it is determined that **the solution has converged**, repeating the processing using an altered parameter value" (emphasis added), as claimed by applicant. Clearly, solving a set of equations at each timestep to **solve the equation**, as in Press, simply fails to even suggest "if it is determined that **the solution has converged**, repeating the processing using an altered parameter value," where the solution is "the solution to the partial differential equation" (emphasis added), in the context as claimed by applicant (see Claim 1 for context).

Again, since at least the first and third elements of the *prima facie* case of obviousness have not been met, as noted above, a notice of allowance or specific prior art showing of each of the foregoing claim elements, in combination with the remaining claimed features, is respectfully requested.

Still yet, applicant brings to the Examiner's attention the subject matter of new Claims 34-35 below, which are added for full consideration:

> "wherein the sum of errors is carried out in floating point texture fragment values over at least one rendering operation utilizing at least one rendering pass of the hardware graphics pipeline" (see Claim 34); and

> "wherein the restriction operation includes mapping and filtering a plurality of grid values onto a grid of lower resolution and the prolongation operation includes mapping and filtering the plurality of grid values onto a grid of higher resolution" (see Claim 35).

To this end, all of the independent claims are deemed allowable. Moreover, the remaining dependent claims are further deemed allowable, in view of their dependence on such independent claims.

In the event a telephone conversation would expedite the prosecution of this application, the Examiner may reach the undersigned at (408) 505-5100. The Commissioner is authorized to charge any additional fees or credit any overpayment to Deposit Account No. 50-1351 (Order No. NVIDP074).

Respectfully submitted,
Zilka-Kotab, PC

/KEVINZILKA/

Kevin J. Zilka
Registration No. 41,429

P.O. Box 721120
San Jose, CA 95172-1120
408-505-5100